UNITED STATES PATENT APPLICATION
FOR GRANT OF LETTERS PATENT

Jack Simpson
Inventor

TRIM EDGE STRIPPER FOR A CORRUGATED BOARD ROTARY CUTTING DIE

RHODES, COATS & BENNETT, L.L.P.
909 Glenwood Avenue
P.O. Box 5
Raleigh, NC 27602
(919) 832-3946

effectively forces the severed scrap material to be expelled from the rotary die assembly along a tangent to the anvil cylinder that is angled or directed significantly lower than the path taken by the trimmed corrugated board product.

TRIM EDGE STRIPPER FOR A CORRUGATED BOARD ROTARY CUTTING DIE

FIELD OF THE INVENTION

The present invention relates to corrugated board rotary cutting dies and the stripping of scrap therefrom, and more particularly to a stripping member for efficiently and effectively directing scrap away from an edge trimming cutting die.

BACKGROUND OF THE INVENTION

Rotary or drum-type cutting dies are commonly used for producing a corrugated board container or carton blank from corrugated board sheet material. Such rotary dies are typically comprised of a pair of cooperating cylinders or drums. One of the cylinders, a cutting cylinder, contains cutting blades or rules while the other, an anvil cylinder, provides a backing surface against which the cut is made.

Rotary cutting dies of the type described above are typically employed to trim the leading and trailing edges of the corrugated board blanks during a die cutting operation. As such, provisions for removing or stripping the severed trim scrap from the cutting die must be provided. Otherwise, if not actively removed from the vicinity of the cutting die, the scrap material tends to collect between the

trim cutting blades and adjacent scrap strips which can result in serious damage to the die board and may ultimately render it inoperable.

Over the past decade, consumers have begun to demand corrugated board products that are completely or nearly completely free of the scrap resulting from die cutting operations. In certain applications, such as in the food packaging industry, it is not uncommon for the presence of minute quantities of scrap material dispersed amongst a stack or pallet of finished corrugated board packaging product to constitute grounds for rejection of the entire stack of product. Therefore, an additional consideration with regard to the stripping or ejection of corrugated board scrap, is the direction in which the successfully stripped or ejected scrap exits the cutting die assembly. As the usable product of the cutting process is typically expelled directly outward from the nip of the rotary cutting die assembly, it is desirable, in order to obtain complete separation of scrap and product, that the scrap be ejected from the rotating cylinders at a significantly different trajectory than the product.

In the past, resilient rubber pads or strips made of closed cell, high density foam or gum rubber have been placed immediately adjacent the edge trimming blades so as to forcibly eject the trimmed scrap material. However, previous resilient trim strippers have suffered from a number of shortcomings. In cases of lead trim strippers, the respective stripper pads are placed just forwardly of the lead trim blades. To be effective, these strippers must normally project outwardly

past the trim blades. Because the strippers normally include generally flat sides and edges, the portion of the strippers that projects outwardly past the trim blades present an unforgiving, generally abrupt initial contact surface for incoming sheets of corrugated board. What typically happens here is that the lead edge of the corrugated board being fed into the die has a tendency to ram the side of the stripper projecting downwardly past the trim blade, causing the stripper to be urged forwardly away from the trim blade. When this ramming action repeats itself, as it can do in a die cutting operation, a number of problems can be anticipated. First, cut trim scrap often becomes jammed or lodged between the stripping member and the cutting blade. As scrap accumulates between the stripping member and the cutting blade, the resilient stripping member can be deformed so as to render it functionally ineffective and furthermore, can actually be pried loose from the cutting die to which it is mounted. In addition to damaging the stripping members, scrap accumulated in the vicinity of the cutting blade can also become wedged between the die board and the blade mounted therein. In such cases, the wedged scrap material may cause the blade to be loosened and begin to wobble within the die board, and in extreme cases, the wedged scrap material may actually crack the die board, rendering it inoperable.

In other cases, the accumulation of unwanted scrap material around the stripper may significantly alter the effective pliability or elastic characteristics of the resilient stripper. As such, the stripping member may actually deform the

urethane coating on the adjacent anvil cylinder, thus rendering the cutting die assembly functionally ineffective.

Therefore, there remains a need for a practical, reliable, and cost effective resilient edge trim stripping member for use with corrugated board rotary cutting dies which prevents the accumulation of trim scrap material around the stripping member or members and which furthermore provides for directional control of the ejected or stripped scrap as it exits the rotary cutting die apparatus.

SUMMARY OF THE INVENTION

The present invention entails a rotary cutting die for cutting corrugated board. The cutting die includes a base that is adapted to be mounted to a rotating cylinder. Secured within the base is a series of trim blades that act to cut trim scraps from around selected portions of a sheet of corrugated board. Disposed adjacent the trim blades is a series of trim strippers that function to strip cut trim scrap from the trim blades during a die cutting operation. Each of the trim strippers includes an upper angled surface that engages cut trim scrap and strips the trim scrap from an adjacent trim blade. The angled upper surface is oriented with respect to the trim blade such that it extends outwardly past the trim blade and at the same time extends at an angle away from the adjacent trim blade.

In particular, in the case of leading edge trim, the respective trim strippers are disposed on the forward or leading side of the trim blade or blades. The angled

upper surface of the trim stripper extends outwardly past the trim blade while angling away and generally forwardly from the trim blade. Thus, the angled surface of the trim stripper forms a non-abrupt surface for contact with the oncoming leading edge of a sheet of corrugated board being fed between the cutting die and an associated anvil. Further, the angled nature of the upper surface acts to hold the cut trim scrap against the anvil for an extended period as the trim strippers and cut trim exit the nip between the cutting die and anvil. This results in the anvil actually directing the cut trim downwardly adjacent the anvil and serves to efficiently separate the trim scrap from the corrugated board product.

In another embodiment of the present invention, each trim stripper includes an outer portion and a flexible deflector extending outwardly from the outer portion of the stripper. In the case of lead edge trim, the flexible deflector happens to lead the trim cut from the lead edge of the corrugated board fed into the die assembly. As the trim stripper emerges from the nip between the cutting die and associated anvil, the deflector projects outwardly in front of the cut trim strip. As the cut trim strip advances, it has a tendency to engage the backside of the deflector, causing the cut trim strip to be deflected downwardly onto the anvil.

It is therefore an object of the present invention to provide a rotary cutting die with leading edge trim strippers that provide for a relatively smooth entry of corrugated board sheets into the nip defined between the cutting die and an associated anvil.

Another object of the present invention resides in the provision of trim strippers for a cutting die that tends to prevent trim scrap from being lodged and jammed between the respective trim strippers and adjacent trim blades.

Still a further object of the present invention resides in the provision of a trim stripper for a cutting die that tends to engage and hold cut trim scrap against an associated anvil after the cut trim has exited the nip between the cutting die and the anvil such that the cut trim tends to follow the anvil and in the process is directed generally downwardly adjacent the anvil.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a typical corrugated board rotary die cutting apparatus.

Figure 2 is a perspective view of the trim stripper of the present invention.

Figure 2A is a side elevational view of an alternative design for the trim stripper.

Figure 3A is a side elevational view of the trim stripper of Figure 2.

Figure 3B is a left side elevational view of the trim stripper of Figure 2 viewed from one end.

Figure 3C is an elevational view of the trim stripper of Figure 2 viewed from the other end.

Figures 4A-4F are a sequence of fragmentary sectional views illustrating the movement of the trim stripper and a sheet of corrugated board through the nip defined between the cutting die and anvil of a rotary die cutting assembly.

Figure 5 is a perspective view of an alternative design for a trim stripper of the present invention.

Figure 6 is a side elevational view of a trim stripper shown in figure 5.

Figure 7-9 are a sequence of views showing the trim stripper of figure 5 and a corrugated board moving through the nip of a rotary die cutting assembly.

DETAILED DESCRIPTION OF THE INVENTION

Shown in Fig. **1** is a corrugated board rotary die cutting apparatus, generally indicated by the numeral **30**. Die cutting apparatus **30** is comprised of a pair of rotatably mounted, cooperating cylinders or drums. More particularly, the die cutting apparatus **30** includes a cutting cylinder **40** and an anvil cylinder **50**. Mounted on the cutting cylinder **40** is a generally cylindrical die board **42**, which is typically made of laminated plywood. Die boards, such as that illustrated in Fig. **1**, typically include a combination of cutting blades, creasing rules, resilient scrap strippers, resilient product ejectors, and the like. As such and with particular regard to the invention disclosed herein, die board **42** includes a series of leading edge trim cutting blades **44**, which are securely mounted therein such that the cutting tips of the blades **44** protrude and extends generally outwardly away from

the surface of the cylinder **40**. Each trim cutting blade **44** includes a pair of opposed sides or edges **44a** and **44b**. For purposes of reference, edge **44a** is referred to as a scrap edge while the other side **44b** is referred to as a product edge. It should be pointed out that the scrap edge **44a** and product edge **44b** are defined relative to the edge of a blank of corrugated board **CB** that is to be trimmed. That is, as the cutting blade **44** moves into position and begins to penetrate the incoming blank of corrugated board **CB**, the blade effectively divides the blank into a trim or scrap region and a product region. The scrap edge **44a** of the cutting blade **44** is defined herein as the edge or side of the cutting blade that is immediately adjacent the scrap region. As such, the scrap edge **44a** of the cutting blade will also be immediately adjacent and face the scrap material **62** (Figure **4C-4F**) that is severed from the blank during the cutting process. Conversely, the product edge **44b** of the cutting blade **44** is defined herein as the edge or side of the cutting blade that is immediately adjacent the finished or product region of the blank **CB**.

Die board **42** also includes a series of trailing edge trim cutting blades **46**, which are securely mounted therein such that the cutting tips of the blades **46** protrude and extends generally outwardly away from the surface of the cylinder **40**. It will be appreciated that, as with the leading trim blades **44**, the trailing trim blades **46** also includes ~~a scrap edge **46a** and a product edge **46b**, which~~ are defined in a manner analogous to that of the leading blade edges.

As shown in Fig. **1**, further disposed on the surface of the die board **42**, immediately adjacent the leading and trailing trim blades **44** and **46**, respectively, are a series of resilient trim strippers, generally indicated by the numeral **10**. In the case of the leading trim blades **44**, the trim strippers **10** are disposed such that they lead the trim blades **44** in the die cutting process. Consequently, the trim strippers **10** are disposed rearwardly of the leading trim blades **44**. Relative to the trailing trim blades **46**, the trim strippers **10** are disposed so as to trail these blades. Consequently, these trim strippers **10** are said to be disposed forwardly of the trailing trim blades **46**.

Shown in Fig. **2** is a first embodiment of the resilient trim stripper **10**, which includes a generally pentagonal shape, with the top of this pentagon being comprised of a pair of angled stripper surfaces **12**. As illustrated in Figs. **3A - 3C**, the pentagonal shaped stripper **10** further includes a generally horizontal base **14**, and a pair of generally vertical, sides **16**. A pair of front and rear edge surfaces, generally indicated by the numeral **18**, form the two remaining sides of the pentagonal shaped stripper **10**. While the edge surfaces **18** are generally vertical in nature, the exact shape of these surfaces, in the embodiment illustrated, is in fact not linear. For purposes of illustration, each edge surface **18** may be considered to be comprised of a separate upper curved or bevel filler region **20** and a lower linear or flat region **22**, as shown in Figs. **2** and **3A**. As will be appreciated from subsequent discussions, the filler region **20** is designed to fit flush against the

//

upper beveled area of a respective trim blade **44** or **46** so as to effectively fill the beveled formed along one upper side or edge of the blade.

Fig. **2A** depicts a slightly different embodiment of the trim stripper **10** than that shown in Fig. **2**. The embodiment of Fig. **2A** is essentially the same as the embodiment of Fig. **2** except that an aperture **15** is formed in the body of the trim stripper **10**. Although the aperture **15** may be placed or disposed in various portions of the trim stripper **10**, in the case of the embodiment shown herein the aperture **15** extends transversely through the body of the trim stripper **10**. Aperture **15** will generally make the trim stripper **10** more compressible for a given hardness. Thus by incorporating the aperture **15**, in some cases it may be possible to extend the height of the trim stripper **10** for a given hardness.

Trim stripper **10** is typically manufactured from a resilient material such as a 70 to 100 durometer closed cell rubber, although foam or other materials exhibiting appropriate resilient characteristics may also be utilized.

As illustrated in Fig. **1**, the anvil cylinder **50** is disposed adjacent the cutting cylinder **40** and is typically surrounded or sheathed with a surface layer or coating **52** of a relatively compliant material such as urethane, which provides a backing surface against which a cut can be made without damaging the cutting blades **44 and 46** or any other cutting blades or creasing rules disposed on the die board **42**. As such, anvil cylinder **50** rotates in a manner that is generally synchronous with the adjacent cutting cylinder **40** during normal operation.

12

Returning now to a discussion of the cutting cylinder **40** configuration, the trim strippers **10** are typically positioned on the cutting die **42** immediately adjacent the cutting blades **44** and **46**, as shown in Fig. **1**. Each stripper **10** is further oriented such that the stripper base **14** is in contact with the die board **42**, as shown in Fig. **4A**. Securing of the trim stripper **10** to the die board **42** is generally accomplished through the use of chemical adhesives or glues which are applied to the stripper base **14**, although other suitable securing techniques could be employed. Furthermore, the size of the base **14** is chosen so as to provide ample surface area for gluing, which ultimately leads to a more secure mounting and a generally longer stripper life span. The cutting blade configuration illustrated in Figs. **4A - 4F** is for a leading edge type trimming operation, as opposed to side or trailing edge trimming. With the stripper base **14** contacting the die board **42**, stripper **10** is further oriented such that one of the edge surfaces **18** abuts the scrap edge **44a** of the trim cutting blade **44**. Positioned as such, it will be appreciated that the contour of the stripper edge surface **18** allows the stripper **10** to mate tightly with the face of the adjacent cutting blade **44**. That is, the upper curved or bevel filler region **20** of the stripper edge surface is contoured so as to generally conform to and mate with the beveled shape of the cutting blade tip, while the lower flat region **22** of the stripper edge surface fits flush against the lower portion of the cutting blade face.

As shown in Fig. **4A**, when positioned adjacent the cutting blade **44** as described above, the angled stripper surface **12** disposed closest to the cutting blade is generally aligned flush with the blade tip in the embodiment shown. From the blade tip, the angled surface **12** extends generally outwardly and away from the scrap edge **44a** of the blade. It should be appreciated that the other angled stripper surface **12** disposed furthest from the cutting blade is not actively involved in the functioning of the stripper. This second angled surface is included primarily as a matter of manufacturing and operational practicality. That is, the additional angled surface is in some respects a convenient side effect of the gluing area considerations related to the stripper base **14**. As discussed previously, enlargement of the base **14** provides a larger gluing surface area for use in mounting the stripper **10** to the die board **42**. Furthermore, the additional angled surface **12** is typically fabricated so as to have a different slope than the adjoining angled surface. This concept is illustrated in Figs. **3B** and **3C**. Thus, the trim stripper **10** is reversal and the die operator can choose between two angled stripper surfaces depending upon the particular die configuration and the properties of the blank material to be trimmed.

As the operation and general construction of rotary die cutters of the type contemplated herein is well known and widely understood, a detailed discussion of the operational theory of corrugated board die cutters will not be presented. It is considered sufficient for the purposes of this disclosure to describe the rotary die

cutter **30** contemplated herein as comprising the die cutting cylinder **40** and anvil cylinder **50**, as described above. In general, these cylinders are rotatably mounted adjacent one another such that a small gap or nip **80** (see Figure **4A**) exists between their opposing surfaces. A partial view of such a typical cylinder configuration is shown in Figs. **4A - 4F**. During normal operation, the cylinders are rotated in opposite directions relative to one another, at approximately the same speed. As such, movement of the cylinder surfaces in the immediate vicinity of the nip **80** will be generally in the same direction, with both surfaces moving at approximately the same speed. Once again, this concept of counter-rotation and uniform surface movement through the nip **80** is illustrated in Figs. **4A - 4F**.

As previously stated, the trim stripper **10** illustrated in Figs. **4A - 4F** is configured to act as a leading edge stripper and, as such, trimming and stripping of the corrugated board **CB** begins with the insertion or entry of the corrugated board blank **CB** into the die cutter **30**. Insertion of the corrugated board **CB** into the die cutter is synchronized with the position of the trimming or cutting blade **44**, such that the edge of the blank that is to be trimmed enters the nip **80** at approximately the same time as the cutting blade, as shown in Fig. **4A**. The cutting blade **44** and incoming blank **CB** will tend to move together into and through the nip with the leading edge region of the blank that is to trimmed just leading the adjacent blade, as illustrated in Fig. **4B**. It will be appreciated that as the blank **CB** approaches the nip **80**, the blade **44** and integrally mounted stripper **10** move closer to the adjacent

blank as a consequence of the cylindrical nature of the cutting die **40**. As the angled surface **12** (that is the angle surface **12** adjacent the blade **44**) of the stripper **10** extends beyond the tip of the cutting blade **44**, the surface **12** makes first contact with the incoming blank **CB**. As described previously, there are two angled surfaces **12** which form the top of stripper **10**, and under normal operating conditions it is the angled surface disposed adjacent and abutting the scrap edge **44a** of the cutting blade **44** which is responsible for making first contact with the incoming blank, as illustrated in Fig. **4B**. More particularly, synchronization of the blank and cutting blade 44 generally insures that the first contact made by angled surface **12** is with the edge or scrap region of the blank **CB** that is to be trimmed.

At this point, it should become apparent that the angled nature of the surface **12** allows the stripper to smoothly contact and capture the leading edge of the blank, greatly reducing the potential for an initial destructive misalignment at the stripper - blank interface. As further illustrated in Fig. **4C**, synchronized movement of the cutting blade **44** and blank **CB** towards the nip **80** brings the blank, trim cutting blade **44**, and stripper **10** continually closer together. The stripper **10**, being constructed of a resilient material, tends to be elastically deformed by the encroaching blank material. The forces generated within the elastically deformed stripper **10** serve to press and hold the contacting blank material firmly against the adjacent anvil cylinder **50**. Simultaneous with this holding action of the stripper **10**, the cutting blade **44** engages and penetrates the

blank material **CB**, effectively severing the leading edge of the blank and producing a segment of leading trim scrap **62**, as shown in Fig. **4C**. It should be appreciated that under normal operating conditions the cutting blade **44** will not only penetrate the blank material, but will also extend into and penetrate the urethane coating **52** that is disposed on the surface of the anvil cylinder **50**.

As the blank **CB** and newly formed trim scrap piece **62** proceed through and past the nip, it will be appreciated from Fig. **4D**, that the blade **44** and integrally mounted stripper **10** tend to move generally away from the adjacent blank and scrap as a consequence of the cylindrical nature of the cylinders **40** and **50**. As this separation of scrap **62** and stripper **10** proceeds, the elastically deformed stripper **10** begins to recoil, and in the process tends to return to its original, generally pentagonal shape. During this recoiling process, the angled surface **12** of the stripper remains in general contact with the severed trim scrap **62**, and continues to hold the scrap material firmly against the receding anvil surface. By doing such, the stripper **10** effectively forces the severed scrap material **62** to be expelled from the die **30** along a tangent to the anvil cylinder **50** that is angled or directed significantly lower than the path taken by the trimmed blank material or product. That is, the trimmed blank product shown in Figs. **4E** and **4F** will tend to exit the die cutter **30** along a straight path that is approximately horizontal, as it is not intentionally held against the surface of the downwardly rotating anvil cylinder **50** following the cut. The trim scrap **62**, however, is

effectively held against the downwardly rotating anvil **50** for a period of time following the cut, and hence acquires some amount of downward velocity from the anvil. As a consequence, the trim scrap **62** tends to be thrown generally downward and clear of both the die cutter **30** and the discharged corrugated board product.

Once again, it should be appreciated that the above descriptions and drawings (Figures **4A-4F**) relate to a leading edge type stripping operations. As such, the stripper **10** is shown positioned on the left side of the cutting blade **44** in Figs. **4A - 4F**. However, the die cutter could just as easily be configured to perform trailing edge type stripping operations, in which case the stripper **10** would be positioned against the right side of a trail edge cutting blade, with respect to the apparatus shown in Figs. **4A - 4F**. It should be noted however that, as per the previous definitions and discussions provided above, in the case of trailing edge trimming operations, the right side or face of the blade would be considered the scrap edge, as the scrap region of the incoming blank would lie to the right of the cutting blade. In any event, the stripper **10** would function in much the same manner as that described above for lead edge trimming operations. That is, the stripper serves to hold the cut scrap edge of the blank against the anvil cylinder and effectively directs the severed scrap generally downwardly and away from the discharged blank product.

A trim stripper, representing a second embodiment and which is similar to the first embodiment described above, is shown in Fig. **5** and is generally indicated

by the numeral **100**. Trim stripper **100** also includes a pair of angled stripper surfaces **112**, a generally horizontal base **114**, and a pair of generally vertical, sides **116**. A pair of edge surfaces, generally indicated by the numeral **118**, form the two remaining sides of the stripper **100**. While the edge surfaces **118** are generally vertical in nature, the exact shape of these surfaces is in fact not linear, as illustrated in Figs. **5** and **6**. For purposes of illustration, each edge surface **118** may be considered to be comprised of a separate upper curved or bevel filler region **120** and a lower linear or flat region **122**, in much the same manner as the first embodiment described above. Furthermore, stripper **100** includes a generally flat upper surface **124**, extending outwardly from which is a flexible, finger-like projection or deflector **126**.

As was the case with the first embodiment described, trim stripper **100** is typically manufactured from a resilient material such as 70 to 100 durometer closed cell rubber, although foam or other materials exhibiting appropriate resilient characteristics may also be utilized.

Once again, the second trim stripper embodiment described herein is substantially like the first embodiment discussed above and performs essentially the same function as the trim stripper **10** of the first embodiment. However, the second trim stripper embodiment performs the additional function of deflecting the severed scrap material as it flies off of and generally away from the die cutting assembly. As such, the discussion of the second trim stripper embodiment

presented below will be generally focused on a discussion of the strippers deflection capability.

Illustrated in Figs. **7 - 9**, is the nip region of the corrugated board rotary cutting die apparatus **30**. Trim stripper **100** is positioned on the die board **42** immediately adjacent the cutting blade **44**, in a manner that is substantially the same as that described for the stripper **10** of the first embodiment. As shown in Fig. **7**, trimming and stripping of the blank **CB** begins with the insertion or entry of the corrugated board blank into the die cutter **30**. Insertion of the blank **CB** into the die cutter is synchronized with the position of the trimming or cutting blade **44**, such that the edge of the blank that is to be trimmed enters the nip at approximately the same time as the cutting blade. The cutting blade **44** and incoming blank **CB** will tend to move together into and through the nip with the edge region of the blank that is to trimmed just leading the adjacent blade. As shown in Fig. **7**, proper synchronization of the blank **CB** and cutting blade **44** also insures that the flexible deflector finger **126** leads the forward edge of the blank as it approaches the nip **80**. As the stripper **100** approaches and passes through the nip, the angled surface **112** generally engages the blank and is elastically deformed in manner analogous to that described above for the first stripper embodiment. Furthermore, in the case of stripper **100**, the flexible deflector finger **126** is deformed such that the tip of the finger is folded back generally towards the cutting blade **44**, as illustrated in Fig. **8**. After the stripper **100** passes through the

nip **80**, the elastically deformed deflector finger springs back to it's original, generally extended conformation. As such, the extended finger **126** effectively blocks or deflects the flight of the severed scrap **62**, following release of the scrap by the angled surface **112** (Fig. **9**). In so doing, the deflector **126** urges the ejected scrap **62** into a lower exit trajectory than might otherwise be accomplished.

In any event, the stripper **100** described in the second embodiment functions in much the same manner as that described above for the first stripper embodiment, with the added benefit of an integral deflector finger **126** which serves to further lower the exit trajectory of the severed scrap material and generally enhance the scrap-product separating performance of the overall rotary die cutting apparatus. That is, the angled surface **112** of the stripper serves to hold the scrap edge of the blank against the anvil cylinder **50** and effectively directs the severed scrap generally downwardly and away from the discharged blank product, while the finger **126** provides for additional downward deflection of the ejected scrap material once this scrap is released by the angled surface **112**.

In Figs. 10 – 14, there is shown a third embodiment for the trim stripper of the present invention. The third embodiment is generally similar to the second embodiment discussed above and indicated generally by the numeral **200** in the drawings. Viewing the trim stripper **200** in more detail, it is seen that the same includes a main body portion and a flexible finger or deflector portion. First viewing the main body portion of the trim stripper **200**, it is seen that the same

includes a base or upper surface **202** that is designed to be secured by glue or other suitable means to the die board **42** that forms a part of the rotary cutting die. In addition the main body portion includes a pair of opposed sides **204**, a trailing edge **206**, and a leading edge **208**. It will be appreciated, that the trailing edge **206** is designed to be disposed adjacent the trim cutting blade **44**. In the embodiment shown in Fig. **10**, the trailing edge **206** is similar to the trailing edge of the trim strippers of the first and second embodiments discussed above. However, it should be noted that the particular shape of the trailing edge **206** can vary from one design to another design. In particular, it may be beneficial to effectively space the majority portion of the trailing edge **206** slightly from the trim cutting blade **44**. This can be accomplished by cutting out a lower portion of the trailing edge **206**. In this case, that portion of the trailing edge **206** disposed adjacent the base **202** would fit flush against the trim blade **44**. Because of the cutout just discussed, there would be a small space on the order of 0.01 inch, for example, between the lower portion of the trailing edge 206 and the trim blade 44.

Continuing to refer to the main body of the trim stripper **200**, it is seen that the same includes a pair of angled surfaces **210** and **212**. The angled surface **210** would serve essentially the same purpose and function as the angled surfaces of the other embodiments discussed herein.

Now turning to Figs. **11 – 14**, there is shown therein a sequence of drawings that illustrates the operation of the trim stripper **200** as it passes through the nip

defined between the cutting die **40** and the anvil **50**. Note in Fig. **11** where the flexible finger or deflector **220** begin to deflect back around the leading edge of the corrugated board **CB** as the corrugated board is fed between the cutting die **40** and the anvil **50**. As the trim stripper **200** advances through the nip defined between the cutting die and the anvil, it is seen that the flexible finger or deflector **220** curls back around a leading edge portion of the corrugated board **CB**. In particular, note in Fig. **12** where the leading edge portion of the corrugated board **CB** has actually been cut by the blade **44**, forming a scrap piece **62**. Scrap piece **62** is partially surrounded or encompassed by the flexible finger **220** and the main body portion of the trim stripper **200**. Again this is particularly shown in Fig. **12**. Moving to Fig. **13** it is seen that the trim stripper **200** has advanced clockwise to a point where it and the cut trim strip **62** has started to move from the nip defined between the cutting die **40** and the anvil **50**. Even in this position, the cut trim **62** is still generally surrounded or retained by the flexible finger **220** and the main body portion of the trim stripper **200**. Thus the trim stripper **200** is acting to exert control over the cut trim piece **62**.

Viewing Fig. **14**, the trim stripper **200** has advanced slightly clockwise from the position depicted in Fig. **13**. Now the flexible finger or deflector **220** has extended and the cut scrap piece **62** has been released to where it lies atop the anvil. However, the deflector or flexible finger **220** still acts to deflect or control the exiting movement of the cut trim **62**. Note in Fig. **14** that the flexible finger or

deflector **220** has the effect of preventing the cut trim piece **62** from flying or moving past the deflector **220**. More particularly, the action of the trim stripper and particularly the flexible finger or deflector **220** generally acts to encourage the cut trim piece **62** to lie against the anvil and to move therewith as the cut trim piece **62** exits the nip. This generally insures that the path of the cut trim **62** will follow the anvil and accordingly will be directed generally downwardly as it exits the discharge side of the cutting die and anvil.

Finally, it should be appreciated that the trim strippers disclosed herein can be placed at various locations on the cutting die for stripping trim from any portion of the corrugated board. Thus the trim strippers disclosed herein can be used to control the discharge of leading and trail edge of trim as well as side trim.

From the foregoing specification and discussion, it is seen that the design of the trim edge stripper of the present invention lends itself to making smooth contact with the leading edge of the corrugated board being fed into the die cutting assembly. Specifically, the angled surface of the stripper generally avoids the problem with hard and abrupt initial contact that can be prevalent with prior art trim strippers. Further, the angled upper surface of the trim stripper discourages the lodging of cut trim between the trim stripper and adjacent trim blades. This avoids numerous problems that are a result of cut trim becoming lodged between the strippers and adjacent trim blades. Finally, the design of the stripper is such that its normal extension beyond the adjacent trim blade tends to hold the cut trim

adjacent the anvil at least momentarily as the stripper and cut trim scrap exit the nip of the die cutting assembly. This urges the cut trim scrap to follow a downwardly trajectory and provides for a more complete separation of the trim scrap from the corrugated product.

The present invention may, of course, be carried out in other specific ways than those herein set forth without parting from the spirit and essential characteristics of the invention. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended Claims are intended to be embraced therein.